タイ王国 潤滑油製造プラント 建設計画調査 報告書

(付 録)

1984年12月

国際協力事業団





# タイ王国潤滑油製造プラント建設計画調査報告書

(付 録)

1984年12月

国際協力事業団

# 

#### LIST OF ANNEXES

MARKET STUDY OF THE LUBRICATING OIL ANNEX II-1

ANNEX II-2 PRICE INFORMATION AND PROJECTION FOR CRUDE OIL, PETROLEUM PRODUCTS AND ITS DERIVATIVES INCLUDING BASE OIL

ANNEX III-1 PROCESS FLOW SCHEME

MAJOR EQUIPMENT LIST ANNEX III-2

ANNEX III-3 CODES AND STANDARDS

ALTERNATE PROCESS SCHEME OF CONVENTIONAL ANNEX III-4 ROUTE

MAXIMIZATION OF THAT LOCAL CONTENTS ANNEX IV-1

BANGCHAK-A ANNEX V-1 PINANCIAL ANALYSIS

FINANCIAL ANALYSIS BANGCHAK-B ANNEX V-2

FINANCIAL ANALYSIS SRI RACHA-A ANNEX V-3

ANNEX V-4 PINANCIAL ANALYSIS SRI RACHA-B

ANNEX V-5 FINANCIAL RATE OF RETURN BANGCHAK-AX, AY

ECONOMIC ANALYSIS ANNEX V-6 BANGCHAK-A

ECONOMIC ANALYSIS BANGCHAK-B ANNEX V-7

ECONOMIC ANALYSIS SRI RACHA-A ANNEX V-8

ANNEX	V-9	ECONOMIC ANALYSIS SRI RACHA-B	
ANNEX	V-10	SENSITIVITY ANALYSIS (BANGCHAK-A)	i-li nevya
ANNEX	V-11	SENSITIVITY ANALYSIS (BANGCHAKAB)	on Sari zaka
ANNEX	V-12	SENSITIVITY ANALYSIS (SRI RACHA-B)	
ANNEX	V-13	CASE STUDY (BANGCHAK-B)	- if k Kansa
ANNEX	V-14	CASE STUDY (SRI RACHA-B) CASE SOURCE	AKRÊK Îll-
	· .		-111 X-RUMA
	1.15%	TO SECURE OF THE CONTROL OF SECURITY SAME SECURITY OF SECURITY OF SECURITY SECURITY OF SECURITY SECURI	STERNAS (113)
	·		
	. * * .	o entre attorio dell'ori in altre otto la programa della della della della della della della della della della Controlla della	· 麦丁聚基 - 基础的程序 
			j-v xaras
		ा १९० वेटारी विशेषक अस्ट्रिक्ट <mark>विशेषक स्ट्रिक्ट विश्वविद्यालया । विश्वविद्यालया । विश्वविद्यालया । विश्वविद्यालया</mark>	KYV, XXXXX
		्रा । इ.स.च्या १८८८ वे १४ - क्षेत्रपूर्ण क्षेत्रका सहस्राहरू सम्बद्धाः । इ.स.च्या १८८८ व्यक्तिका स्टब्स्ट्राहरू	
		A PARTICIAN DE LA PROPERTIE DE LA PRESENTACIÓN DE LA PROPERTIE DEL PROPERTIE DEL PROPERTIE DE LA PROPERTIE DEL PROPERTIE DE LA PROPERTIE DEPURBIE DE LA PROPERTIE DE LA PROPER	
		প্রান্তির প্রান্তির বিশ্ববিদ্যালয় হৈছিল। প্রান্তির প্রান্তির বিশ্ববিদ্যালয় হৈছিল। কিন্তু স্থানী ক্রিক্টিনির বিশ্ববিদ্যালয় হৈছিল।	\$-\$\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\
		Translation of the second of t	ANTES V
			CM XXXXA

### ANNEXII

#### ANNBX 11-1

MARKET STUDY OF THE LUBRICATING OIL

elosteja Rickleja							
The state of the s							
A Company of the Comp							

#### CONTENTS

ANN	ex II	-1 MARKET STUDY OF THE LUBRICATING OIL
1.	Vehi	cles (Transportation on Road) AII-1-1
2.	Tran	sportation AII-1-2
	2-1	Railway AII-1-2
	2-2	River Transportation by Self Propelled Vessels AII-1-2
	2-3	River Transportation Except Self Propelled Units
	2-4	Coastal Transportation Except Petroleum AII-1-5
	2-5	Crude Oil Import AII-1-7
	2-6	Crude Oil Transportation From Sri Racha to MOR AII-1-8
	2-7	Petroleum Products Import (Fuel, Lube Oil and Base Oil) AII-1-9
	2-8	Petroleum Products (Puel) Transportation from Sri Racha to Bangkok AII-1-10
	Conc	clusion of "2. Transportation" AII-1-13
3.	Agri	culture, Fishery, Porest and Cold Storage AII-1-15
	3-1	Agriculture AII-1-15
	3-2	Fishery AII-1-15
	3-3	Porest AII-1-16
	3-4	Cold Storage AII-1-17
	Conc Fore	clusion of "3. Agriculture, Fishery, est and Cold Storage" AII-1-18
4.	Cons	struction AII-1-20
	Conc	clusion of "4. Construction" AII-1-21

5.	Blectric Power Generation	A11-1-23
<b>3.</b>	5-1 Blectric Power Generation of Blectricity Generation Authority of Thailand (EGAT)	
	5-2 Blectric Power Generation of Provincial Blectricity Authority (PEA)	
	Conclusion of "5. Blectric Power Generation"	À11-1-26
6.	Manufacturing	ATT-1-28
	6-1 Refinery	AII-1-28
	6-2 Viscose Rayon	AII-1-29
٠.	6-3 Nylon and Polyester	ATT-1-30
¥ .	6-4 Textile Pabric	AÎÎ=1-32
	6-5 Pertilizer	A11-1-33
	6-6 Sugar	
	6-7 Rubber	
	6-8 Plywood	
. •	그 그 그 그 그 그들은 그는 그 그 그 그 그 그 그 그 그 그 그 그 그는 그는 그는 목	A11-1-39
	6-10 Plate Glass	建国际运荡机 医慢性动物
÷	6-11 Caustic Soda	
* 4		
	tron (nicectic ruthace Products)	
	6-14 Parts	
	6-15 Plastic Polymer	
	6-16 Paper	AT1-1-48
	6-17 Liquid CO2 and Dry Ice	AII-1-49
	6-18 Beverage	AII-1-50
	Conclusion of "6. Manufacturing"	AII-1-52
•		
· · · ·	- 2 -	

7.	ew Project	AII-1-56
	7-1 Gas Separation Plant	AII-1-56
	7-2 Fertilizer Project	AII-1-57
	7-3 Rock Salt Project	AII-1-59
	7-4 Soda Ash Project	AII-1-59
	7-5 Petrochemical Project	AII-1-60
	7-6 Caustic Soda Project	AII-1-60
	Conclusion of "7. New Project"	AII-1-62
ÓV ("	ll Lubricating Oil Consumption - "7") for Industry	AII-1-63

#### 1 Vehicles (Transportation on Road)

#### Data of vehicles is shown in Table AII-1-1(1) to (6).

Santa and and the first of the control of the contr gent page 2122 to lake the be-**多有工具有管理等**。 化基础电影电影 化基础电影 (1997) 1997。 1997 1998 1998 1997。 bas trans to remaind classed carres at the feether · 新国南部建筑在省市 医部门抗菌物或自由抗原的。 如此不知在了 ศัสด์สหมู สิทิศสตร์โรมดุ โดย การครู ครัว กลี เริ่มก็อัน มีสิ่งก็ได้ไ ್ ಪ್ರತಿಗಳ ಕೆಲ್ಲಿಗಳ ಬೆಂದು ಬರುಗಳು ಬರುವುದು ಬರುವುದು ಬರುವುದು ಬರುವುದು ಬರುವುದು ಬರುವುದು ಬರುವುದು ಬರುವುದು ಬರುವುದು ಬರುವುದ ಸಂಪರ್ಧಕ್ಕೆ ಕೊಡಡಿತುವ ಮುಂದಿಕೆ ಮು ាក់ ខ្លែងម៉ែងសំនិងស្គារ៉ានៅ និង ខែជា ដែលវិកាន់។ ការស្រាស់ សំនាក់សង្គារ៉ានៅ សំនាក់សង្គារ៉ាន់។ 以大山東朝史殿、南京大学、李宇、大学、大学、大学、大学、大学、大学、大学、大学、大学、大学、 16806,800 可能量 (1.5 m. 2.4 m. ≰卷集 (3.5 d. m. 1 m. ) (1.4 m. € 4.6 d. m. m. m. ) 63 (A) 的自己的人的人的 នួនអ្វីក្នុងស្នង មានសម្រេចប្រើប្រឹត្តិត្រង់ការ ដែលដែលនាក់ សេវីសុសស ជាសេសមាន សេវីដី នៅពេញ ប្រើបាន ១៣

ga belanisah Gun ahligi pumpu lim angi milali di Langah ali minakalangi mini limbi limbi di mini Liubay, siyabyit di manjin di angi limbi di mini Agayitiani ist babom mining manji di mining

#### 2-1 Railway

# NUMBER OF DIESEL LOCOMOTIVES AND LUBE OIL CONSUMPTION IN THAILAND IN 1983 AND 1993

កាត្ត ១៩ ១១៨៤៩ដែល**ាវ**១ សក្សប៊ី

÷	Number of Diesel Locomotives	Engine Oil Grease3) Total $(k1)$ $(k1)$
1983	2721)	1,5901) 0.031) 1,590.03
1993	5042)	2,945 0.05 2,945.05

Notes: 1) Source: State Railway of Thailand

 Average annual growth rate in estimated as follows which is the same of estimated growth rate of GDP. (Hereafter referred to as growth rate of GDP)

1983 - 1986 68 1987 - 1993 6.5%

3) Unit of grease is ton, but the consultant estimate that ton is equal to kl.

#### 2-2 River Transportation by Self Propelled Vessels

#### NUMBER OF VESSELS AND LUBE OIL CONSUMPTION

• :	Number of Vessels	Engine Oil (kl)	Industrial Oil (kl)	Total (kl)
1983	10,5081)	533)	43)	57
1993	12,809	63	<b>5</b>	68

Notes: 1) Source: Calculated from Kaiji Kokusai Kyoryoku Center (hereafter referred to as KKKC) data in 1981.

- 2) Average annual growth rate is assumed to be 2% by the consultant.
- 3) Units lube oil consumption are estimated as follows from the experiences in Japan.

  Engine oil consumption 5 lit/unit.year Gear oil consumption 0.4 lit/unit.year (Industrial oil)

- 2-3 River Transportation Except Self Propelled Units
  - (1) Tonnage of Vessels in 1981

Source: KKKC

- (2) Preconditions of Base Oil Consumption in 1981
- (xt) = secare of navigation (Source: KKKC)

The Cho Phrayo River: Gulf of Thailand-Nakon Sawan

The Nan River: Nakon Sawan-Uttaradit 370km

One navigation is estimated by the consultant as follows: (380km+270km)/3=217km

- 2. Horse power of total vessels (Source: KKKC)

  Horse power of total vessels is 144,500sp which is

  same as the tonnage.
  - 3. Navigation hours per one voyage is as follows:

    217km / (5kn x 1.852km) x 2 = 46.8hours (two ways)

    5kh is the speed of vessel.
    - 4. Number of Voyages

4days for loadings and unloading of goods.

365days/(4+2)days x 50%=30voyages

50% is the operating ratio.

5. Lube oil consumption by unit was acquary raying

0.35cc/HP.hr. Tri by sections To commune (1)

Estimated by the consultant from the experience in Japan.

- (3) Lube Oil Consumption in 1981
  - 0.35cc/HP.hr x 144,500HP x 46.8hr x 30 voyages=71k1

Hereafter, lube oil consumptions of barge and ship are calculated by the same say.

Engine oil 71kl x 80% = 57kl Marine cylinder oil 71kl x 20% = 14kl (Industrial oil)

80% and 20% are estimated by the consultant from vessel size which was estimated by KKKC.

(4) Lube Oil Consumption in 1983 and 1993

	Total Tonnages	Engine Oil	Marine Cylinder Oil (Industrial Oil)	Total
1981	144,500	57	्राज्योगारीयस्थानुस्य वर् <b>ष्ट्री वेटल</b> ् <b>14</b>	71
1983	150,338	59	44 74 F a 45 3 3 3 3 3 3 4 3 5 1	74
1993	183,261	72	18 11 81 132	90

Note: Average annual growth rate is estimated to be 2% by the consultant.

#### 2-4 Coastal Transportation Except Petroleum

- (1) Preconditions of Lube Oil Consumption in 1981 हेराच तक्का**र्वेशक्ष्य हर्द्वकार्य । हैर**्ड के कार्य के कार्यक कार्यक्र
  - 1. Distance of one navigation

Bangkok - Sattaheep 200 km Bangkok - Song Khla

355 km

established but substitute at the contract 2. Horse power of total vessels to Sattaheep and Song Khla Man we million were to the take

Total DWT for coastal transportation 447,000 DWT dedas editioned sens person entry e establish

Total tonnage is segregated by both populations.

To Sattaheep 447,000DWTx378=165,390DWT=165,390HP To Song Khla 447,000DWTx63%=281,610DWT=281,610HP

3. Navigation and loading and unloading days

To Sattaheep

in lyder Navigation 200km/(5knx1.852km)x2=43hr=2days

because in Loading and unloading

encial to the left of the private of the private

3days

Total

ofter PotatePrict

5days

To Song Khla

Navigation 355km/(5knxl.852km)x2=77hr=4days

Loading and unloading

3days

7days Total

Note: 5km is the speed of vessel.

4. Number of voyages of the angle of the second

To Sattaheep ... 50% = 36.5voyages

To Song Khla 365days/7days x 50% = 26.1voyages

Note: 50% is operating ratio

5. Lube oil consumption by unit

0.35cc/HP.hr

Estimated by the consultant from the experience in Japan.

化三氯基 斯爾斯 医阿克斯氏毒素

(大) 1966年 (1964年) 1964年 (1964年) 1964年 (1964年) 1964年 (1964年)

医医神经纤维蛋白 化物学通常 在最终精神基础的的影响 医心脏的神经

(2) Lube Oil Consumption in 1981

 To Sattaheep
 91k1

 To Song Khla
 198k1

 Total
 289k1

in 1981 in 1983 (k1)

Engine oil  $289\times348=98$   $98\times(1.04)^2=106$ Harine cylinder oil  $289\times668=191$   $191\times(1.04)^2=207$  (Industrial 0il)

Note: The rate of 34% and 66% are estimated based on ship size.

医圆线 医多线 马帕二的

# (3) Lube Oil Consumption in 1983 and 1993

Average annual growth rate is estimated 4% by the

	Tonnage (1,000 ton)	Marine Cylinder Engine Oil Oil (Industrial (kl) Oil (kl)	Total (kl)
(1981	447	98	289)
1983.	483	106 207	313
1993	715	157	463
1910)		到,我们就没有一个。" 第二章我还是我们的人,	

# 2-5 Crude Oil Import

politic editor outself

(1) Lube Oil Consumption for Crude Oil Import in 1982

等其實。主義的學術的意思學術的學術的學術的學術的學術的學術的學術的學術。 例如,我們們說是學術學術學術學術學術學術的學術學術學術學術學術學術

Lube oil consumption for crude import in 1982 is shown in Table AII-1-2.

**文章要求** (1995年) 20年1年 (1995年 - 1995年 -

(2) Lube Oil Consumption (Supplied by Thailand) for Crude Oil Import in 1983 and 1993.

	1983 - 11	re <u>as<b>. 19</b>9</u> 3
Import Crude Oil (10 <sup>3</sup> kl)	9,226	13,669
Import Crude Oil for which Thailand Supplies Cons. Lube Oil (103kl)	9,1012)	2,9743)
Marine Cylinder Oil (kl)4)		94.0 14.4 14.5
Other Industrial O(15)	2.0	94.0 0.1
Grease (kl)6)	0.2	0.01
Total (kl)	194.2	14.51

- Note: 1) Source: Table AII-1-2.
  - 2) Import crude oil except China for which Thailand supplies consumed lube oll.
  - 3) Import crude oil except China and Middle East for which Thailand supplies consumed lube oil.
  - 4) Estimated by Table AII-1-3.
  - 4) and 5) are industrial oil.
  - 5) 6) Estimated 1% on marine cylinder oil is other industrial oil and 0.1% is grease.

# 2-6 Crude Oil Transportation from Sri Racha to MOR

MOR receives import crude oil in Sri Racha tank yard, then the crude oil is transported to MOR by small tanker.

Crude	0il (10 <sup>3</sup> kl)	Marine Engine Oil (Industrial Oil) (kl)
(1982	2,8521)	83) <sup>7</sup>
1983	2,8522)	**************************************
1993	3,3712)	

Notes: 1) Source: OIL AND THAILAND 1982
All-1-8

- (Source: NEA)
  - 3) Tanker Size 25,000DWT; Horse power 17,600sp Speed 5kn, Distance 65nm; Unit lube oil consumption is 1.16cc/HP.hr.
- 2-7 Petroleum Products Import (Puel, Lube Oil and Base Oil)

Puel means LPG, gasoline, jet fuel, kerosene, diesel oil and fuel oil (except lube oil, wax and others).

- (1) The Import products for which consumed lube oil supplied by Thailand in 1982 are shown in Table AII-1-4.
- (2) The consumed lube oil which is supplied by Thailand for products import in 1982 is shown in Table AII-1-5:
- (3) Lube Oil Consumption (Supplied by Thailand) for Product
  Import in 1983 and 1993

ន្ទី១មូនិស <sup>្</sup> មុ	i kangabang pangang ang kangang kangan Kangang kangang kangan	<u> 1982 </u>	1983	1993
	Import Products (10 <sup>3</sup> kl	2,476	2,645	4,883
	Marine Cylinder Oil (k	1) <sup>4)</sup> 51.1 <sup>2)</sup>	54.6	53.23)
	(Industrial Oil)	i di karangan karang Karangan karangan ka	5 ( )	5.1 53.7
	Other Industrial Oil <sup>4</sup> ) (Industrial Oil)	0.5	0.5	0.5 /
		0.05	0.05	0.05
	Total	51.65	55.15	53.75

- Notes: 1) Source: Table AII-1-3. Fuel Import (1)+
  Lube oil (4) + Base Oil import.
  - 2) Source: Table AII-1-4.

Consumed lube oil supplied by Thailand is to be assumed by the consultant as follows:

in 1983	Middle Bast	100%
	China	08
	Other Countries	50%

3) Consumed lube oil supplied by Thailand is as follows:

in 1993 Middle East 0% China 0% Other Countries 50%

arakan da Shariya da A

#### 4) Industrial Oil

- 2-8 Petroleum Products (Fuel) Transportation from Sri Racha to Bangkok
  - (1) Precondition to be Assumed by the Consultant
    - 1. Import fuel: MOR Réceived in his dépots.

TORC and Esso

1/2 Received in their depots.
1/2 Received in their refineries.

To the Control of the Care of the Care

- TORC and Esso transport 85% of import fuel which is received in their refineries and produced products from Sri Racha to Bangkok by sea.
- 3. Total DWT: 1,452 (answer of Company A),
  Horse power: 1,452sp
  Carring capacity: 1,400kl, Speed: 5kn,
  Distance (from Sri Racha to Bangkok): 70nm,
  Unit lube oil consumption in average: 0.255cc/HP.hr
  (By the experience in Japan)

#### (2) Transportation Volume of Fuel from Sri Racha to Bangkok

(Unit: 1,000 kl)

		TORC and Esso		TORC and Esso		•
	Puel Import	Fuel Import (2)	(2)x1/2 (3)	Puel Production (4)	(3)+(4) (5)	(5)x85% (6)
1982	2,314	1,556	778	6,0661)	6,844	5,817
1983	2,467	1,659	830	6,066	6,896	5,862
1984	2,518	1,694	847	6,066	6,913	5,876
1985	2,043	1,366	683	6,495	7,178	6,101
1986	1,572	1,045	523	6,925	7,448	6,331
1987	1,555	1,064	532	7,553	8,085	6,872
1988	2,183	1,493	747	7,553	8,300	7,055
1989	2,843	1,945	973	7,553	8,526	7,247
1990	1,316	971	486	9,824	10,310	8,764
1991	2,045	1,509	755	9,824	10,579	8,992
1992	3,403	2,511	1,256	9,824	11,080	9,418
1993	4,883	3,603	1,802	9,824	11,626	9,882

#### Notes: (1) Source: 3) of Table AII-1-5.

- (2) Fuel oil import by TORC and Esso is Their corresponded to their CRUDE OIL TOPPING CAPACITY to be assumed. (Source: EMP)
- (3) 1/2 of import fuel is received in refineries, another 50% is received in their depots.
- (4) 1) Source: "OIL AND THAILAND 1982"
  After 1983, these are corresponded to CRUDE
  OIL TOPPING CAPACITY to be assumed.
  (Source: EMP)
- (6) 85% of imported and produced products of TORC and Esso is transferred from Sri Racha to Bangkok by sea, which is surveyed by the consultant.

# (3) Lube Oil Consumption in 1983 and 1993 and appropriate the consumption in 1983 and 1993

(Unit: 1,000 kl)

		# 	Marine C inder Oi (Industr		
	Transport <sup>1</sup> Product	Oil_	Oil)	Grease <sup>3</sup> ) Tota	1
1983	5,817	21.5	21.5	0.04 43.04	2
1993	9,882	36.0	36.0	0.07 72.07	۲.

#### Notes: 1) Source: Above Table.

2) 50% of lube oil consumption is engine oil and another 50% is marine cylinder oil, assumed by the consultant due to transportation vessel sizes.

흥분선 (

3) It is assumed that 0.01% of lube oil consumption is grease consumption.

un di Bargini son Subun di Italian

# Reference: Base oil plant is not decided, so lube oil consumption for base oil transportation from the base oil plant to the blending plant can not be estimated, but it is very small.

19. 位于《松林》(1987),表表来是《A

。 《《中文》(1945年)(1970年)(1970年)(1980年)(1980年)(1980年) 《中文》(1980年)(1980年)(1980年)(1980年)(1980年)(1980年) 《中文》(1980年)(1980 CONCLUSION "2" TRANSPORTATION

LUBRICATING OIL CONSUMPTION (1)

13	A marginary of the property of the contract of	Answer for Questionneire	1 9 8 3 bubricating Oil Consumption (kl)	Average
	Production of the second of th	m Engine oil Industrial Crease Total	Engine Oil Industrial Grease Tr	Total (1983-1993)
1 7	2-1 Railways Commence 272 Cansen	1,590.03 272 Cows	1,5900	1,590.03 Growth Rate
2-2	\$ 7 ° . 1	N.A. 2)	53.0	57.0 2
12	the state of the format decreases.	N.A.	59:0 15.0	74.0 2
1,	Coastal Trans.	N-A-1	207.0	313.0 4
1 %	2-5 Crude	N.A. (250 C) SA CONTRACTOR OF THE CONTRACTOR OF	194.0 0.20	194.2
<b>%</b>	ξ	N.A.	<b>0.8</b>	8.0
7		N.A. PONT.	55.1 0.05	55.15
24	Petroleum Prod. Trans. Sri. Racha to Bangkok	N.A.C. Transfer of the contract of the contrac	21.5 22.5 0.06	43.04
	Total		1,829.5 504.6 0.32 2,3	2,334.4

Notes: 1) MOR receives import grude oil in Sxi Racha tank yard them transports to MOR.

2) N.A. 1 not available.

CONCLUSION "2" TRANSPORTATION

LUBRICATING OIL CONSUMPTION (2)

	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		Lubricat	Lubricacing Oil Consumption (kl)	umpeton	(K1)
		Production	modue of	Industrial Oil	Grees	Total
1 7 ×	2-1 Xailway	504 care	2,945.0	R.	0.05	2,945.05
2	Miver Trans. Propelled	12,009 Vensels	63.0	5.0	:	68.0
2-3	River Trans.	163,261 connages	72.0	18.0	•	0.0%
4	Coastal Trans. Ex. Petroleum	715,000 tonneges	157.0	306.0	•	463.0
Š	Crude	2,974,000 kl	•	24.5	0.01	14.51
8	Crude Irans. for MOR	3,371,000 X1	The second secon	0*6	•	0.6
2-7.	Petroleum Prode, Import	4,883,000 Ki	And the second s	53.7	0.05	53_75 <sup>30</sup>
- T	Petroleum 2-8 Fred Trans - Sri Racha	9,862,000 XL	0.96	0*9€	20.0	72,07
-	to Bangkok			1		

Control of the second of the s

- Agriculture, Fishery, Porest and Cold Storage
- 3-1 Agriculture state acres
  - THE REPORT OF THE PARTY OF THE (1) Agriculture Machinery in Use and Average Growth Rate: See Table AII-1-6
    - (2) Estimated Number of Agriculture Machineries From 1983 то 1993:

See Table AII-1-7

(10th Ito Holdstyn er brit get 1000, 1010, 1015 (3) Estimated Lube Oil Consumption By Agriculture Machineries: See Table AII-1-8 

#### 3-2 Pishery

(1) Fish Captured

Estimated quantity of fish captured for the following period in Thailand is shown below.

e kabapatawa kita kabul

(Unit: ton/year) 1985 Pish Captured 1983 1990 1982 Report Profit Contraction of 1,861,000 1,800,000 1,500,000 1,560,000 1,560,000 Marine - in Thai 1,761,000 1,700,000 1,400,000 1,450,000 1,450,000 Therritorial Waters . oc - Out of Thai 100,000 100,000 100,000 110,000 110,000 Territorial Waters .663° e83°. 159,000 197,000 Inland 134,000 200,000 200,000 1,995,000 1,959,000 1,697,000 1,760,000 1,760,000 Quantity of the second

Fish Captured

Ministry of Agriculture and Cooperatives, Department of Fisheries

## (2) Lube Oil Consumption with the constitution of the constitution of the consumption of the constitution of the consumption of

Lube oil consumption for fish captured in Thailand is not available, so the Consultant estimate by using Japanese data (source: the Japanese Government and Japanese company).

Total lube oil consumption: 4.51kl/1,000 ton

Breakdown 3.157 kl/1,000 ton Engine oil (70%)
1.353 kl/1,000 ton Marine cylinder oil (30%)
(Industrial oil)

TENNESS STATE SE

#### (3) Lube Oil Consumption in 1983 and 1993

	Fish Captured	Engine Oil	Marine Cylinder Oil (Industrial Oil) (kl)	Total
1983	1,959	6,185	2,650	8,835
1993	1,760	5,557	2,381	7,938

#### 3-3 Porest

# (1) Wood Production and Lube Oil Consumption

Total	1,769,358	1 674 60	<del>ក្នុង</del> ទៀតដ <b>9</b> 9
Octions	11111202		133333 13333
Others	1,711,282	1,517,89	
Teak	58,076	56,84	13 <sup>5 2 6 3</sup>
	1982	1983	lavadí
randra de la compansión d La compansión de la compa	ing sa	(Unit:	m <sup>3</sup> )
			4

Lube oil consumption: engine oil 141 lit/year in 1982.

Source: Ministry of Agriculature and Cooperatives

#### (2) Lube Oil Consumption in 1983 and 1993

(1982) 1983 1993

Forest Production(m<sup>3</sup>) (1,769,358) 1,574,699 1,574,699

Engine Oil (0.141) 0.125 0.125

Consumption(k1)

The wood production decreased from 1,769,358m<sup>3</sup> of 1982 to 1,574,699m<sup>3</sup> of 1983, thus the Consultant estimates that average annual growth rate is zero from 1983 to 1993.

#### 3-4 Cold Storage

		Company A	1983		<u>1993</u>
Cold Storage	jet.				
Capacity	(ton)	3,500 1)		, , , , , , , , , , , , , , , , , , ,	· 新春 · 诗
	(m³)	3,000 1)	7,814	2)	9,556 3)
Ľubė Oil Co (Industrial	nsumption Oil)	(k1) 24 1)	63		76

#### Note: 1) Answer of Company A

2) Cold storage capacity in Thailand is estimated by Ministry of Agriculture and Cooperatives.

		1982	1983	1985	1990	1995
Capaci	ty 7	,546	7,814	8,205	9,025	9,228
(m <sup>3</sup> )						Ā

 Cold storage capacity in 1993 is estimated from above figure.

CONCLUSION OF "3" ACRICULTURE, FISHERY, FOREST AND COLD STORAGE

LUBRICATING OIL CONSUMPTION (1)
AGRICULTURE, FISHERY, FOREST AND COLD STORAGE

			Answer for O	Questionnaire	0,14/		E & G =			Avezage
		Production (1963)	• - •	Industrial Oil	Greese Total	sal Production	Engine Oil Industrial Grease To	Greese	Total	Growth Rate (1983-1993)
3-1	. Agriculture		N.A.		* # #		6,688.0 3,947.0	1	10,635.0	Final Rato
3-2	Fishery	1,959,000	1		1	1,959,000 ton	6,688.0 2,650.0	•	6,835,0	:
Ĩ	Forest	1,769,000") m3	141 115./9		1	2,575,000	0.125	87, 1	0.125	
ĭ	Cold Storage	\$,000,000 m	. •	8 11t./y		7,814,000 m3	0.59	1 2 <b>1</b> 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	63.0	
	Total						12,873-1, 6,660-0	6	19,533.1	

CONCLOSION OF "3" AGEICULTURE, FISHERY, FOREST AND COLD STORAGE
LUBRICATING OIL CONSUMPTION (2)
AGRICULTURE, FISHERY, FOREST (AND COLD STORAGE

					1	1
) Ç	Total	24,304	7,938	0.125	76	32,318.1
motton	Crease Total		184 \$1.€4			
rubricating Oil Consumption (kl)	Industrial	9,414	2,381		92	11,871.0
	Engine Oil	14,890	755,8	0.125		20,447.1
	Production		1,760,000	1,575,000	9,556,000 m	
		3-1 Agriculture	3-2 Flebery	3-3 Forest	Cold Storage	rotal
		;	ž	្ជ	4	

#### 4 Construction

Construction Cost and Lube Oil Consumption

Unit Lube<sup>3)</sup>
Oil
Consumption
(lit./
million

Bahts) 1978 1981 1983 1993

Consumption 13,5831) 16,6601) 19,0742) 37,5222) Expence (million Bahts) Total 1,613 3,173 0.08457 Lube Oil Consumption Breakdown Engine Oil 0.02114 403 793 2,380 1,210 Industrial Oil 0.06343

#### Notes: 1) Source: NESDB

- 2) Growth rate is estimated as 7% which is the same growth rate between 1978 and 1981.
- 3) Unit lube oil consumption is estimated from the experience in Japan.

|--|

CONCLUSION OF "4" CONSTRUCTION

LUBRICATING OIL CONSUMPTION (2)

1 9 3

Reduction Engine Oil Industrial Greese Total
Oil Oil 37,522,000 793.0 2,380.0 - 3,173.0

### 5 Blectric Power Generation

# 5-1 Blectric Power Generation of Electricity Generation Authority of Thailand (EGAT)

## (1) Porecast of Electric Power Generation of EGAT

## BLECTRIC POWER GENERATOR (INSTALLED CAPACITY & PUTURE CAPACITY)

					Gas Turbine		it: MW)
		Hydro Power	Thermal	Gas Turbine	Combined Cycle	រាប់ ស្ស័ និក្សាស្	Toal
EGAT	April	1,380	1,927.5	745	englister († 1905) Kanglister († 1905)	34.6	4,087.1
	1982	1,380.6	1,927.5			33.6	4,086.7
EGAT				nsajar ir			·
		1,496.9	2,477.5	265	720	33.6	4,993.0
egat		1,988.9	3,477.5	265	720	33.6	6,485.0
egat			4,302.5	2 <b>65</b>	720	33.6	7,823.8
EGAT					720		
Sour	ce: 🏋	<b>EGAT</b>				* 4	
-	(2) 1	Lube Oil	Consumpt <b>i</b> o	n in 19	83 and 1993		
80.0: 80.6:		rins	ali di Santa di Sant Santa di Santa di Sa		1983	1	993
	and the second second	4 T 4 C 4 C 4 C 4 C 4 C 4 C 4 C 4 C 4 C	érator (MW)	4,954	,93)+33.62)	9,145.5	3)+33.62)
				Total	4,993	9.	179.1
		Bagine Oi	1 (kl)	5	(4,854 lit <sup>1</sup> )	• )	54)
				298	(297,710 lit	1),	5504)
	- 1	Total (	kl)	303	(302,564 lit	1),	5554)

#### EGAT tax years rewall adopted to 1),2),3) Source: Notes:

- Power generation capacity (MW) of diesel is no change from 1982 to 1995. 2)
- Other power generation capacity (MW) except diesel is hydro, thermal, gas turbined combined cycle. These 3) are increasing every year.
- Calculated from the expected capacity of electric power generation.

#### Electric Power Generation of Provincial Blectricity Curifica estro o depriodenti. Authority (PEA)

#### 。但以此相对 如原 (1) Porecast of Blectricity Power Generation of PRA

#### ELECTRIC POWER GENERATOR (INSTALLED CAPACITY & FUTURE CAPACITY)

(Unit: MW)

April	- 1.Ne	Diesel 29.5	<u>Total</u>
		471)	29.5
PEA 1983		20.0832;	20.083
		20.083	
PEA 1985	<u>+</u>	20.083	20.083
PEA 1990 -			
PEA 1995			20.083

40.5 380.2009 - 96.000 1 13880 s

### (2) Lube Oil Consumption in 1983 and 1993

	Diesel Engine (kl)	oil
1983	2521)	
1993	252	

Note: The growth rate of electricity power generation is zero percent.

1) Source: PEA

CONCLUSION OF "5" BLECTRIC POWER CENERALION

LUBRICATING OIL CONSUMPTION (1)

		Anawer for Oue	è	e l				1.9.8.3			Average
	Production	Dubricating Profes Oil Inc		Consumption (KL)	Total	Production	Engine Of	Să.	umption	(X1)	Growth
			297.710		302.564			T TO	9	1000 P	(1963-1993)
5-1 EGAT	4,993 MW 4,854 Lite. Lite.	4,854 Lit.	114.	•	134.	4,993 MW	0	298.0	: ] •	303.0	
5-2 PEA	20,083 MW	251,656 11c.	1	•	251,656 115.	20,083- MW	282.0	•	,	252.0	0
Total					1 . · · · · · · · · · · · · · · · · · ·		257.0	298.0	,	555.0	

Colon weeks fro edgs (\$)

a tip o top (tips) (in the second property) (in the second property)
 b tip o top of the second property (tips)

			60			
	(4:8.1		(100	. \$\dot{\psi}		i eraki kanalaran dari dari dari dari dari dari dari dari
RATION	ideta.o					
ELECTRIC POWER GENERALION	PTION (2)		1 1 1 1 1 1 1 1 1 1 1 1		19. 1971 19. 19. 19. 19. 19. 19.	្សាស្តីស្តាល់ ឬមាន ប្រើសាស ស្តាស់ស្តាស់ស្ត្រី ស្តា ស្ត្រីស្តាស់ ស្ត្រីស្តាល់ ស្ត្រីស្តាល់ ស្ត្រីស្តាល់ ស្តេស្ត្រីស្តាល់ ស្ត្រីស្តាល់ ស្ត្រីស្តី ស្ត្រីស្ត្រី ស្តាល្ចុស់ស្តីស្តីសំតុស្ត្រី ស្តាស់ស្ត្រីស្តីសុស្ត្រី
CONCLUSION OF "5" ELECTR	LUBRICATING OIL CONSUMPTION (2)	Lubricating 011 Consumption (k1): jine Oil Industrial Grease Total	0.5555.0	252.0	907.0	<ul> <li>(2) (2) (2) (3) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4</li></ul>
CONC		1993 Imbricating 011 Con Engine Oil Industrial	0.088	252.0	257.0 550.0	
		Production	9,179 MW	20,083 HW		
			S-1 EGAT	5-2 PEA	Total	

ATI-1-27

#### 6 Manufacturing

#### 6-1 Refinery

### (1) Lube Oil Consumption Ratio of 3 Refineries

Production <sup>1</sup> Total in 1982 (1,000 kl)	Production Ratio (as AR6)=1.00)	Light Production in 1982 (1,000 kl)	Light Production Ratio (as AR6) 1.00)	Lube 011 Consumption Ratio (as AR6)=1.00)
Refinery A 2,726	1.00	1,532	1.00	1.00
Refinery B 3,363	1.232)	2,745	2.793)	1.634)
Refinery C 2,704	0.99	1,847	1.21	0.8735)

#### Notes: 1) Source: OIL AND THAILAND 1982

- 4) The lube oil consumption ratio of Refinery B (as Refinery A=1.00) is calculate as follow.

  [(2) + 3) ) 2 | 0.7
- 5) The lube oil consumption ratio of Refinery & (as Refinery A=1.0) is estimated from CRUDE TOPPING CAPACITY (Source: EMP).
- 6) AR is Refinery A.

(2) Lube 011 Consumption in 3 refineries in 1983 and 1993

	Lube	Oil	Lube	ption	Lube	ption	l Tot (k)	
	19831	1993	19832	1993	19832)	1993	1983	1993
Engine Oil	1.8	2.1	2.9	5.4	1.6	2.1	6.3	9.6
Industrial	30.3	35.8	49.4	91.2	26.5	34.7	106.2	161.7
Total	32.1	37.9	52.3	96.6	28.1	36.8	112.5	171.3

#### Notes: 1) Answer of Refinery A

- 2) 1) x Lube oil consumption ratio (as Refinery A 1.00)
  - \*1 Lube oil consumption of each year for 3 refineries is corresponded to CRUDE OIL TOPPING CAPACITY (source: EMP).

医囊膜病病 医格特里氏 医多种基质 医二甲基 化双氯化 医皮肤炎

		. 1,1 (41.7)			Capacity
	25.8	z <u>-</u>		2 2 1 1 East	
			. 1.	NECK SERVER	Ratio
		· ·	1983	1993	Between 1983/1993
				<u> </u>	
Topping (				23,725	
(1,000 b	<b>b1</b> )			43,800	
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		Ref.C	17,520	22,995	1.3125
		E 17.45 17.8	61,320	90,520	1.4762

The lube oil consumption for increase topping capacity of every year is a half.

## 6-2 Viscose Rayon

442

(1) Viscose Rayon Production in 1983, Answer of Company A:

The future average annual growth rate of viscose rayon production in Thailand is estimated zero.

## (2) Lube Oil Consumption in 1983 and 1993 and 1993

14 - 1		11:- <u>8</u>	1983 (kl)	ya edek 28 ko yaka	1993 (kl)
Industria	al 0il		8		8
Grease		<u> </u>	1.2	<u> </u>	1.2
Total	4 E		9.2		9.2

Note: The lube oil consumption in 1983 is the answer of Company A.

## 6-3 Nylon and Polyester

## (1) Nominal (Name Plate) Capacity and Production in Thailand

计通讯设计 化二氯化二氯化二甲基酚磺酰乙酰胺 化氯磺酸 使电影 第二

		Polyester Filament	Nylon Pilament	Nylon Staple	Total
Nominal Capa	city in 198	2 (ton/day)			
Teijin Thai Melon Toray Nylon Asia Piber Hantex Oriental Fil		30 20 20 - 7	15 15 15 12	45	150 80 35 15 19 45
Total	180	77	42	45	344
Production i	in 1982 (ton	/year)		(11	3,5201))
en e	48,958	19,726	13,6	34 8	2,318

Note: 1) 344 ton/day x 330 days = 113,520 ton/year (Nominal Capacity)

Source: Japan Chemical Piber Association ( )

Average annual growth rate is 8.9% which is estimated from EMP data of the raw textile growth rate between 1982 (1,385 MMSY) and 2001 (6,992 MMSY).

#### (2) Production and Lube Oil Consumption, Answer of Company A

Production in 1983	
Nylon Pilament Yarn	6,866 ton/year
Polyester Pilament Yarn	7,682 ton/year
Total	14,548 ton/year

Lube oil consumption in 1983

Industrial Oil 23,374 lit1) / 14,548 ton/year States arrivants, at and confidence of the air

= 1.61 lit/ton

Grease

234 lit<sup>1)</sup> / 14,548 ton/year

uban estat hi man the in brite them in the confidence of the con-

安丰 化十二十分分配

V. 383

The first and water the sticker to the Total 23,608 lit

Sourcei 1) Answer of Company A

(3) Production and Lubricating Oil Consumption in Thailand in 1983 and 1993 ene per la 1903 and 1933 ene per per la companya de la compa

ក់ក្នុងស្រីស្រី ស្រី សម្រីស្ព្រះស្រី	Nylon and Polyester Production!)	Industrial Oil2)		Total
	(ton)	(k1)	(k1)	(k1)
1983 1993	89,644 210,282	139 257	1.4 2.6	140.4 259.6

- (6) 1) The consultant estimates production in 1983 Notes: and 1993 based on the data of Japanese Chemical and Fibre Association 82,318 ton in 1982, and growth rate 8.9% which is raw tex-tile growth rate estimated by EMP.
  - 2) Answer of Company A
    - 1. The lube oil consumption for increased production of each year is a half.

2. The consultant assumes when production is increased 1.5 times (50% up) of 1983 production, a new plant is listabled. The year of newly installation the lube oil consumption is 100%.

#### 6-4 Textile Pabric

(1) Textile Machineries in Thailand

Number of textile machineries is shown in Table AII-1-9.

Average annual growth rate of spinning is 10.2% from 1971 to 1981, and that of weaving is 5.3%, but the Consultant estimates those growth rates of 8.9% as is estimated by EMP.

(2) Unit Lube Oil Consumption

Unit lube oil consumption of spinning and waring are show in Table AII-1-10.

(3) Number of Machines and Lube Oil Consumption in Thailand in 1983 and 1993

	Number ofl Machineries Units	) Engine <sup>2</sup> ) Oil (kl)	Industria Oil (kl)	12) Greasê (kl)	1 THE R. P. LEWIS CO., LANSING, MICH.
in 1983				- SICKE)	<u>(k1)</u>
Spinning Weaving	1,572,748		60	12	72
Total	37/338	8 8 10	177 237	1.7	186.7 258.7
in 1993					
Spinning Weaving Total	1,712,726 62,441	19	140 15	28	168 438
		19	555	32	606

- Notes: 1) Estimated from Table AII-1-9.
  - 2) Estimated from Table AII-1-10.
    The lube oil consumption for increase number of machineries for each year is 100%, not a half, because the textile industry is gathering small machines.
- 6-5 Pertilizer (Excepting New Fertilizer) Plant Based on Natural Gas)
  - (1) Production and Lube Oil Consumption in 1983, Answer of Company A

Production: 252,050 ton

Lubricating Oil Consumption and Unit Consumption

Bugine Oil 3,947 lit./252,050 ton = 0.0157 kl/

Industrial 0i1 24,112 lit./252,050 ton = 0.0957 kl/ 1,000 ton

Grease 2,084 lit./252,000 ton = 0.0083 kl/ 1,000 ton

30,143 lit.

(2) Thai Production

加速扩展的数据 5.1度,创。

Production in 1983: 290,000 ton (Source: Company B)

- Average annual growth rate is the same with Thai GDP growth rate.
  - (3) Production and Lubricating Oil Consumption in Thailand in 1983 and 1993

Compound Fertilize (1.000 ton	r Oil	Industrial Oil (kl)	Grease (kl)	Total (kl)
1983 290	5	28	2.4	35.4
1993 368	<b>5</b>	32	2.8	39.8

- Notes: (1) The lube oil consumption for increased production of each year is a half.
  - (2) New fertilizer project will be completed in October 1986, thus the production of existing plant will not be increased after 1987.

#### 6-6 Sugar

na a de Geller (j. j.

(1) Process Sugar Production and Lube Oil Consumption in 1983, Answer of Company A.

Raw Sugar	73,864.03	toi
Refined Sugar	39,852.80	tói
White Sugar	34,042.45	toi
Production		"

rotal 147,759.28 ton

Lube Oil consumption and unit consumption

Engine Oil 6,279.5 lit./147,759.28 ton = 0.042 kl/1,000 ton

Industrial 011 53,922.0 lit./147,759.28 ton = 0.365 kl/1,000 ton

Grease 1,745.5 lit./147,759.28 ton = 0.012 kl/1,000 ton

(2) Sugar Production and Lube Oil Consumption in Thailand Between 1983 and 1993

### PROCESS SUGAR PRODUCTION AND LUBE OIL CONSUMPTION

	Process Sugar Production (1,000 ton)	Engine Oil (kl)	Industrial Oil (kl)	Grease (kl)	Total (kl)
1982 (S) 1983 (S) 65	2,7681) 2,666 2,568 2,473 2,3821)	116.3 114.2 112.1 110.1 108.2	1,010.3 991.7 973.8 956.5 939.9	33.2 32.6 32.0 31.4 30.9	1,159.8 1,138.5 1,117.9 1,098.1 1,079.0
\$ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	2\525	111.2	966.0	31.8	1,109.0
	2\676	114.4	99316	32.7	1,140.1
	2\837	117.8	1,023.0	33.7	1,174.5
	3\007	121.4	1,054.0	34.7	1,210.1
91	3,1871)	125.2	1,086.9	35.8	1,287.
92	3,378	129.2	1,121.8	36.9	
93	3,581	133.5	1,158.8	38.1	

Note: 1) Source: EMP the south diet.

Production other than the above is estimated by the Consultant based on EMP data.

The lube 011 consumption for increased or decreased production of every year is a half.

#### 6-7 Rubber

(1) Tires and Inner Tubes Production and Lube Oil Consumption in 1983, Answer of Company A

#### Production

	Tires	Tubės
Vehicle (Standard Type)	61,784	43,973
Vehicle (Radial Type)	181,250	ញ្ញឹង្សី (mile)
Pick up	292,241	167,321
Bus & Truck	139,079	121,265
Tractor (Front Wheel)	11,597	12,402
Tractor (Rear Wheel)	14,145	12,068
Grades	12,011	13,142
Total	712,107	370,171
To.	tal 1,082	,278

### Lube Oil Consumption and Unit Consumption

	en e		Unit Lube Oil
-	Engine Oil	627 lit.	0.58 lit./1,000 tires and tubes
	Industrial Oil	16,326 lit.	15.08 lit./1,000 tires and tubes
	Grease	3,420 lit.	
		20,373 lit.	

(2) Production of Tires and Tubes and Average Annual Growth Rate in Thailand

## 

600,0	00,5	निस्देश <u>।</u>	Acres 6	3,668; <u>5</u> 96	Tubes		(Units)
ana , u	Páss Cár	enger Tyres	and Bus	Tractor Tyres	* inner rubber	Total tyres	<u>Total</u>
1976	463	922	826,050	42,289	1,332,261	803,780	2,136,041
					1,735,349		
1978	708	3,680 v	1,285,82	64,498	2,059,000	1,118,864	3,177,864
1979	575	766	1,219,55	49,379	1,844,696	1,213,285	3,057,981
1980	- 517	1,007	1,151,40	49,414	1,718,830	1,345,420	3,064,250
1983	e ji ngi	Jaguy	n Bakkin (11)	ing digital and the second		ing the field of	3,650,000
					ខណ្ឌ។ សុខ្ទុំ ខ		

Average annual growth rate based on Bank of Thailand data between 1976 and 1980 is 9.48 in total. But the Consultant estimates growth rate of tires and tubes as 68 of the growth rate of vehicles.

(3) Production of Tires and Tubes and Lube Oil Consumption in Thailand in 1983 and 1993

The of war without

### PRODUCTION OF TIRES AND TUBES

	Production -			:
	of Tires Engine and Tubes Oil (kl)	Industrial Oil (kl)	Grease (kl)	Total (kl)
	3,650 2.1	51	10.6	63.7
15 15 V 1 1 9 93 NOT	\$206,536 \$1 (2) 13,2 16	76	14.2	93.4

#### 6-8 Plywood

62,310

ji €±£.

(1) Production of Plywood and Lube Oil Consumption, Answer of Ministry of Agriculture and Cooperatives of Thailand

Kind of Plywood	1982	1983	1985	1990	1995
Plywood (sheet)	2,014,323	2,497,232	2,800,000	3,600,000	4,000,000
Hard board (sheet)	•			5,500,000	Te belongs
Total	5,255,480	6,585,732	7,300,000	9,100,000	11,000,000
Lube Oil(lit	.) 43,724	51,945	54,500	59,950	64,900
Grease (lit	.) 2,012	2,160	2,200	2,300	2,390
rotal	45,736	54,105	56,700	62,250	67,290

(2) Production of Plywood and Lube Oil Consumption in Thailand Between 1983 and 1993

	Production (1,000 sheets)	Industrial Oil Grease (kl) (kl)	Total (kl)
1983	6,5861)	51,91) 2,21)	54.11)
1984	6.943	53.2 2.2	55.4
1985	7,3001)	54.51) 2.21)	56,72)
1986	7,629	55.6 2.2	57.8
1987	7,973	56.6	<b>1458.9</b>
1988	8,332	57.7	60.0
1989	8,708	58.9 2.3	61.2
1990	9,1001)	60.01) 2.31)	62.31)
1991	9,452	60.0 2.3	63.2
1992	9,817	61.9 2.3	64.2
1993	10,197	62.9	65.3

1993 10,197 62.9 2.4

Note: 1) Data of production and lube oil consumption is mentioned in above figure.

Source: Ministry of Agriculature and Cooperatives of Thailand

#### 6-9 Cements were transported and the second and the

(1) Production of Cement and Lube Oil Consumption in 1983, Answer of Company A

## Production

Mixed Cement 3,264,000 ton

Portland Cement (X) 1,359,000 ton

Portland Cement (Y) 124,000 ton

Total 4,747,000 ton

Lube oil consumption and unit consumption:

Engine Oil 85,422 lit./4,747,000 ton

Industrial 0(1 168,138 lit:/4,747,000 ton = 0.0354 kl/l,000 ton

Grease 3,767 lit./4,747,000 ton = 0.00079 kl/l,000 ton

Total 257,327 lit.

हिंगे सद्यात है। के देवें बड़ी।

√45\64 |666,288. α deadbil00145 πierer

- **74,250** täd/yest

(ម៉ានិស្ត ខែមុខម៉ែង ដូចរំបន់ជនភ្នំបំ)

. 10(2) Cement Production in Thailand Between 1982 and 2001

1982 1986 1991 1996 2001 Cement (million ton) 6.66 8.53 11.52 15.57 21.03

(Source: EMP)

# (3) Production of Cement and Lube Oil Consumption in Thailand Between 1983 and 1993

## PRODUCTION AND LUBB OIL CONSUMPTION

	PRODUCTION	•			
	Production (million ton)	Bngine Oil (kl)	Industriál O(1 (kl)	Grease (kl)	Total (kl)
1983	7.09	124	244	6	374
1993	13.00	183	360	8	551

Note: 1) The production in each year is estimated based on EMP data.

- 1. The lubricating oil consumption for incrased production in each year is a half.
  - 2. The year of newly installation, the lube of 1 consumption is 100%.

#### 6-10 Plate Glass

(1) Production of Plate Glass and Lubé Oil Consumption,
Answer of Company A

#### Production in 1983:

Sheet Glass: 5,000 cases/day

4 kg/case x 5,000 cases = 225,000 kg/day = 74,250 ton/year (Operation days) 330)

#### (2) Lube Oil Consumption in 1983

a contraction of the	or <u>lit</u>	nit k1/1,000 ton
Engine Oil	1,764	0.0238
Industrial Oil	3,873	0.0522
Grease	2,006	0.0270
Total	7,643	

## (3) Plate Glass production in Thailand

ំនុស្សី ម៉ូរ៉ូស្នៃ ខែ ដូច្នេះ ស្ថិរ ស្ថិរៈ ស្ថិរៈ ស្ថិរៈ ខេត្ត និងប្រាស់ នេះ ប្រាស់ ប្រាស់ ប្រាស់ ប្រាស់ ប្រាស អ្នកស្រីស្ថិរ ស្ថិន្ស ស្ថិន្ស ស្ថិន្ស ស្ថិរៈ ស ស្រីស្រីស ស្ថិរៈ ស

(3) Place Glass producer			it in the second of the second	
1982	1986	1991	1996	2001
Plate Glass 85	102	139	188	255
(1,000 ton),	,	10 00 1	1	
	ស បានសំពាន់ក្រែក្រែក	er soletik	(Source:	EMP)

(4) Production of Plate Glass and Lube Oil Consumption in Thailand in 1983 and 1993

Plate glass Bogine <sup>2</sup>	) Thanctrial	2)	
production 011 (1,000 ton) (k1)	OTT	Grease <sup>2</sup> (kl)	Total (kl)
1983 69 2.1	4.6	2.4	9.1
1993 157 3.7	8.2	4.2	16.1

Notes: 1) The production of each year is estimated based on EMP data.

2) The lube oil consumption for increased production is not a half, because the lube oil consumption is very small.

#### 6-11 Caustic Soda

(1) Production of Caustic Soda and Lube Oil Consumption in 1983, Answer of A Company

Production in 1983:

NaOH

60,739 ton

Caustic Soda Production in Thailand is same as Company A.

(2) Lube Oil consumption

Engine Oil

14,400 liter

(3) Porecast of Caustic Soda Production

New petrochemical project is completed in July 1987, thus the caustic soda production by existing plant will not be increased after 1988.

(4) Average Annual Growth Rate

<u>1970</u> <u>1980</u>

NaOH Production in Thailand

32,745

62,130

Growth Rate 6.6% p.a (1970-1980)

Source: Bangkok and Japan Treading Center.

(5) Lube Oil Consumption in 1983 and 1984

tin na tra art ga mbi gas eta ila (k

	NaOH Production (ton)	Industrial Oil (kl)
1983	60,739	14.4
1993	78,433	 18.6

Note: The lube oil consumption is not a half for increasing product, because the lube oil consumption is very small.

#### 

(1) Production of Oxygen and Nitrogen Gas and Lube Oil Consumption in 1983, Answer of A Company

#### Production

Liquid Oxygen	6,704,000 SM <sup>3</sup>
Nitrogen	3,270,000 SM3
Total	9,974,000 SM <sup>3</sup>

#### Lubé Oil Consumption

	ngine 011		50 lit.
	ndustrial	oi1	.,400 lit.
	otal		,450 lit.

## (2) Gas (02, N2) Production in Thailand

There are 6 similar kind of companies (source: Siam Directory), therefore the consultant estimates that Thai production is 5 times of Company A's production to be considered plant size.

## Production in 1983

。如此**是自己的人,这个人的人,他们也没有一个人的人,不是不是一个人的人,不是不是一个人的人** 

$$9,974,000 \text{ SM}^3 \times 5 = 49,870 \times 10^3 \text{ SM}^3$$

### Lube Oil Consumption in 1983

Engine Oil < 3.333, 50 lit. x 5 = 250 lit. = 0.3 kl Industrial Oil 1,243 lit. x = 6.215 lit. = 6.2 kl

#### (3) Average Annual Growth Rate

Average annual growth rate is estimated as follows which is the same of estimated growth rate of GDP.

## (4) Production and Lube Oil Consumption in 1983 and 1993

tega e e e la la	Production of Gases (1,000 SM <sup>3</sup> )	Engine Industrial Oil Oil Total (kl) (kl)
1983	49,870	0.3 62 62.3
1993	92,301	0.4 92 92.4

Note: The lube oil consumption for increasing production in each year is a half. The year of newly installation the lube oil consumption is 100%.

#### 6-13 Steel and Iron (Blectric Purnace Products)

(1) Production and Lube Oil Consumption in 1983, Answer of Company A

Production: 147,934.98 ton

Lube oil consumption and Unit Consumption

	and the same of the same and the same of	≢ 0.	1288 kl	/1,000 to
Industrial Oil			1.5	
		= 0.	1065 k1	/1,000 to
Grease	55,728	1it./14	7,934.3	化二唑 计分别 经产品 医牙髓
<u> </u>	<u>a da ki nanya bak</u>	= <b>0.</b>	3767 kl	/1,000 to

# (2) That Electric Furnace Production

	Annual Production			
Name of Company	Capacity	1977	1978	1979
The Bangkok Iron Steel Works Co.,		47,400		
Ltd.				
Bangkok Steel Industries Ltd.	90,000 MT	44,000	70,000	70,000
G.S. Steel Co., Ltd.	140,000 MT	95,000	100,000	117,000
The Siam Iron &	, 135,000 MT			127,000
Thai India Steel	42,000 MT	N.A.		21,000
Thai Pattana Casting Steel		N.A.	N.A.	8,000
Co., Ltd.		- 1414 at 2 44 at 1		
Total	527,000	282,600	362,200	382,200

Average annual growth rate was 16% between 1977 and 1979.

The consultant estimates the growth rate in 1979 as 16%, then the growth rate has been going down 1% every year, and after 1988 the growth rate will be constant of as 7%.

# (3) Lube Oil Consumption in 1983 and 1993

	Blectric	i Vitalo di Boto			
	Purnace Products Production 1,000 ton)	Bogine Oil (kl)	Industrial Oil (kl)	Grease (kl)	Total (kl)
1983	634	65	53	192	310
1993	1,367	122	100	371	593

Note: Lube Oil Consumption is a half for increased production. The year of newly installation the lube oil consumption is 100%.

#### 6-14 Parts

- (1) Production and Lube Oil Consumption in 1983, Answer of Company A and Company B
- 1. Answer of A company

Products: Véhicle part Lube Oil Consumption: Engine Oil 4.5 kl

There are 12 similar companies (Source: Slam Directory).

2. Answer of Company B

Products: Pipes and Pittings 2,600 ton
Lube Oil Consumption: Engine Oil 0:3 kl
Industrial Oil 13.5 kl

There are 16 similar companies (Source: Siam Directory).

3. Total of Lube Oil Consumption

 $\frac{\text{Engine Oil}}{\text{Vehicle Parts}} = \frac{\text{Engine Oil}}{4.5 \times 12} \pm \frac{54 \times 1}{2.5 \times 16} = \frac{216 \times 1}{216 \times 16}$ Pipes and Fittings  $0.3 \times 16 \pm 5 \times 1$   $13.5 \times 16 = 216 \times 1$ 

(2) Average Annual Growth Rate

Average annual growth rate is estimated as the same of estimated growth rate of GDP.

### (3) Lube 011 Consumption in 1983 and 1993

	Engine Oil (k1)	Industrial Oil (kl)	Total (kl)
1983	59	216	275
1993	109	399	508

Parts shops are very small, so the consultant Note: estimates lube oil consumption for increased production is not a half.

#### 6-15 Plastic Polymer

FOR STATE OF STREET 

ses, errorighting

1:10 35.23

(1) Production and Lube Oil Consumption in 1983, Answer of and the state of t

PVC F	tes	in		All for		43	,171	ton
PVC (	Com	pour	id		1	20	,044	ton
Tota						63	,215	ton

#### Lube oil consumption:

Industrial Oil 9,053 liter

## (2) Plastic Polymers Production in Thailand

	19801)	19832)	19932)
PVC Resin (ton)	48,000	· -	
PVC Compound (ton)	24,000	· ·	
Total (ton)	62,000	73,843	136,670

Notes: 1) Source: Industrial Pinance Corporation Thailand (IFCT)

2) The Consultant estimates the production by the growth rate of production is same to Thai GDP growth rates.

## 3. Lubricating Oil Consumption in 1983 and 1993

	Plastic Polymer Production (ton)	Industrial Oil
1983	73,843	10.6
1993	136,670	19.6

Note: Lube Oil consumption for increased production is not a half, because lube oil consumption is very small.

。1966年1月1日日 - 人名巴西加西 Bast Microsoft (1965年)。

#### 6-16 Paper

## (1) Production and Lube Oil Consumption in 1983, Answer of Companies A, B, and C

	Paper Production (ton)	Õi l	Industrial Oil (lit.)	Grease (lit.)	
Company A (Refined paper)	12,109.69	3,277	57,653		62,101
Company B (Tissue paper)	9,000	697		220	6,603
Company C (Board)	49,500		43,100		43,100
Total	70,609.69	3,974	106,439	1,391	111,804

## (2) Paper Production in Thailand

	1982	<u>1986</u> <u>1</u>	991 1990	5 2001
Paper (1,000 ton)			102 1,624	
			(Sóu	ce: EMP)

#### (3) Lube Oil Consumption in 1983 and 1993

The state of the s	Paper Engine Production 011 (1,000 ton) (k1)	Industrial Oil (kl)	Grease (kl)	Total (kl)
1983	434 22	600	8	630
1993	1,287 55	1,447	20	1,522

Note: Lube Oil Consumption is a half for increased production of every year, the year of newly installation the lube oil consumption is 100%.

#### 6-17 Liquid CO2 and Dry Ice

(1) Production and Lube Oil Consumption in 1983, Answer of Company A

## PRODUCTION AND LUBB OIL CONSUMPTION

		Lube Oil Consump (Industrial O	tion il)
Liquid CO2		especialists	
Dry ice	225 ton	and the first of the	·
Total	3,125 ton	2.2 kl	

### (2) Liquid CO2 and Dry Ice Production in Thailand

There are two companies producing liquid CO2 and dry ice (Source: Siam Directory).

times of Company A's production due to the capacity.

 $3,125 \text{ ton } \times 3 = 9,375 \text{ ton in } 1982$ 

(3) Average Annual Growth Rate decided 46 decided (4)

The consultant estimates the growth rates which is the same of estimated Thai GDP growth rate.

tana kalanda da kabupatèn Kabupatèn Bangan Kabupatèn Bangan Kabupatèn Bangan Kabupatèn Bangan Kabupatèn Bangan

(4) Lubricating Oil Consumption in 1983 and 1993

· · · · · · · · · · · · · · · · · · ·	Liquid CO2	
	& Dry Ice Production I ( <u>1,000 ton)</u>	ndustrial Oil (kl)
1983	10.0	7.0
1993	18.5	13.0

- Notes: (1) Lube oil consumption for increased production is not a half because lube oil consumption is very small.
  - (2) Liquid CO2 and dry ice production capacity is big, so it is not necessary to install new plant within 1993.

configurations and the configuration of the configu

#### 6-18 Beverage

(1) Production and Lube Oil Consumption in 1983, Answer of Company A

#### Production:

Beer and Soft Drink 180,802 kl about (S)

#### Lube oil consumption

	Unit consumption (kl/1,000 kl)
Engine Oil	10,023
Industrial Oil	
Total	15,039

### (2) Beverage Production in Thailand

1982 1986 1991 1996 2001
Beverage (106 ton) 1.05 1.40 2.04 1.96 4.31

(Source: EMP)

The Consultant assumed 1 ton is of beverage is same as 1kl.

## (3) Lube Oil Consumption

	Bevera Product (1,000	lon	Engine Oil (kl)	Industria Oil (kl)	à 1	Grease (kl)	Total (kl)
198 199	1,128 2,368		60.4 102.7	30.2 51.3		0.8	91.4 155.4

Notes: Lube oil consumption for increased production of each year is a half. And the year of newly installation of plant is 100%.

MANUFACTURING CONCEUSION "6"

LUBRICATING OIL CONSUMPTION (1) MANUFACTURING (1)

			Angwer for Questionnaire	Quentionna	3.20			100,000	(13) KONNESSEED OF STATES STATES	, 40,100		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
		Production	Engine oil	Iting Oil Cor Industrial	Greens (ton)	Total	Production.	Engine Oil	industrial	Grease (ton)	Total	Rate (1983-1993)
1	6-1 Rollmony	Topping Cap. of A Ref.") 2,726,000ki	<b>80</b>	30.3		32.1	Topping Capacity 61,320,000ki	6.3	106.2		112.5	NEA Data
ĩ	Viscose Rayon	17,000 ton		8.0	1.2	9.3	17,000 ton		9.0	1.2	9.3	٥
6.0	Nylon Acid Polyestar	14,548 ton		23.374	0.234	23.608	89,644 ton	7 - 4	139-0	1.4	140.4	8.9
1	Textile Febric	•	N.A.					<b>0</b> *6	237.0	13.7	258.7	6.9
ij	rertilizer	252,050 ton	3.947	24-112	2.034	30,143	290,000 con	<b>.0-S</b>	28.0	2.4	35.4	CDP Growth Rate
ý	Suger	147,759 ton	6.2785	53.922	1.7455	62.947	2,666,000 ton	114.2	991.7	32.6 1	1,138.5	ENP Deta
7.	Rubber	1,082,000 Tires & Tubes	0.627	16.326	3.42	20,373	3,650,000 cires & rubes	77.2	51.0	10.6	63.7	<b></b>
j	Plywood	6,586,000 Sheets		51,945	2.16	54.105	6,586,000 Sheets		51.9	2-2	<b>54.</b> 2	Covernment Data
ĵ	Cement	4,747,000 ton	85.422	168.138	3.767	257_327	7,090,000 ton	124.0	244.0 mm	6.0°	374.0	EMP Data
on of	6-10 Plate Class	74,250 ton	1.764	3.873	2.006	7.643	89,000 ton	7.7	4. C.	2.4	* T.	DATA DATA
7	Caustic	60,739 ton	14.400			14.4	60,739 con	<b>37. 7.</b>	ages) are entre survival.		14.4	9.9.
Notes	Note: *) 1982											

CONCLUSTON "6" MANUFACTURING

LOBRICHTING OLL CONSUMPTION (1)

And the second s	Comment of States and Comment of the	Answer for Questionaline Lubricating Oli-Consumption Lubricating Oli-Consumption Engine Oli (Ton)	Answer for ou Lubrionting Engine of I	Answer for Questionnaire Lubricating Oil Consumption (kl) ngine Oil Industrial Gresse Tota	Stream Crease (Ton)	Total	Production	metro	1 9 8 3 Froduction Ingine Oil Industrial	Consumption (KI) clal Greese Tot (Ton)	Total	Average Crowch Rate (1983-1993)
7	6-12 Cas. 102	. N. J. 9. 974.000 am	\$0.0	and the second second	tergri Zin Tohawaya Marija	12,73	49,870 am				62.3	COP Crowch Rate
<b>6.13</b>	Steel and Iron	6-13 Steel and 147,935,000	19.049		5-754 55-728 90:531	765.06	6347000 ton6520	65.0	O. 6.	192.0	310.0	310.0-16878
.6-I4	6-14 Parte s	**************************************	A STATE OF THE PROPERTY OF THE	n. Standard Subbarries Section 1997	N. Highertone of Albacoline	PALLETTE TO COMMENT SERVICE SERVICES	West of the complete of springer developes.	0.65	A 104 No. 228 CO	reducero 🕶 Armenia de Canada ante i	275.0 GPP	Growth Rate
	6-15 Pleste	63,215 con		£\$0*6		\$.053	9.053 73,843 con	The second secon	930T. usana s		10.6	10.6 Growth Rate
\$1 <del>-</del> 9	Papex	6-16 Paper 20,610,000	3.974	106-44	1.39.1	111.804	1.39 111.804 34,000 ton 225.0	23.To	600.0	8.0	63000	63000 End Data
6-17	identa cos- of Dry Ice	6-17 Liguid CO2 3,425 con		2.2		2.2 2.2	10,000 ton		in an increase the production	company to take the control of the first terms.	7.0	GDP CONTH RATE
6-18	6-18 veverage	780 <u>,</u> 802 xJ	10.023	2.016	The second secon	15.039	15.039 LX 000,821,1 60.21	60.74 mm	3075	8.0	91.4	ENT Data
To the state of th	Total			e service y and a service serv	A COMPANY OF THE PROPERTY OF T		To and the first of the first o	482.6	2,840.2	273.3 3,596.3	.596.3	The state of the s
	nor sonta			also (1) in the second of the		A company of the comp		231.1	3,124,2	300.6 3,955.9	6.556	-: -: -: -:

CONCLUSION "6" MANUTACTICATION

LUBRICATING OLL CONSUMPTION (2) MANUFACTURING (1)

	3.993								. •
	Production Engine Oil Industrial	Consumption (KL)	Total	Romorks					
6-1 Rotinery	90,520,000 9.6 161.7		171,3						
6-2 Viscope Rayon	17,000 con	1,2	9.2	-					
6-3 Nylon and Polyester	210,1282 con - 257.0	2.6	250.6						
Salar Managara Company of the Compan	255.0	32.0	0.909						
6-5 Fereillesez 368,000 con	368,000 'con 5.0 32.0	8	86						
6-6 Sugar	0.881,1. 2.5.8.1. 000,188.0	T 88.	1,330.4						
6,536,000	6,536,000 Tires & Tubes	14.2	93:4		A Trade of Section 1997			50	· · · · · · · · · · · · · · · · · · ·
6-8 Plywood	6-8 "Paywood Carollon 10,1197,000 (6-8 ")	2.6	65.3						And the control of th
6-9 Comon Companies (No. 1)	0,096 000,000 000,000 000,000 000,000 000,000 000,000 000,000 000,000 000,000 000,000 000,000 000,000 000,000		9.0	en de maria de la compresión de la compr	a symmetricity contribution			The second secon	
6-10 Plate Class	6-10 Plate Class 157,000 ton September 16, 2 of Sep	Andrew Company of the	16.1	And the second of the second o			A Comment of the Comm	Charles	The state of the s
6-11 Caustio	7.8.433. Comment of the form of the first of	And the second s	18.6.	in the section of the sec	And the control of th	Comment of the control of the contro	Acceptation of the control of the co	And the second s	Control of the contro

CONCLUSION "6" MANUFACTURING

LUBRICATING OIL CONSCHAFION (2)

-			rapr	ៈ∤ខ្មី	sumpetion (k1)		
		Production	Ingine Oil	in Industrial	Industrial Crease Total	** ** ** ** ** ** ** ** ** ** ** ** **	!
6-12	6-12 (0 <sub>2</sub> , N <sub>2</sub> 4, others)	92,301,000 sm3	<b>6</b>	92.0	26		·
6-13	Steel and 1,367,000 Iron ton	1,367,000 ton	122.0	-0.001	371.0 593.0	Blecttle furnace products	
5-14	6-14 Parts		109.0	399.0	0,*805	Parts of vehicle, pipes and fittings	
\$1-3	6-15 Plastic Polymer	136,670 con		19.6	59°61 (1)		
6-16	6-16 Paper	1,287,000 ton	55.0	1,447.0	20.0 1,522.0		
6-17	6-17 bay Ice	18,500 ton	<b>1</b>	13.0	- 13.0		
61.18	6-18 Veverage	2,368,000 ton	102.7	52.3	1.4 135.4		
	focal		764.7	4,801,5	497.9 6,064.1		
	Plus 104		841.2	5,281.7	547.7 6,670.6		
ĺ							

- 7 New Project
- 7-1 Gas Separation Plant
  - (1) Treated Gas

350 SCPD

(2) Completion Date

Nov. 14, 1984

(3) Production

Production for Gas Separation Project

Ċź

358,000 ton/year

C3 :

223,000 ton/year

LPG (C3, C4)

250,000 ton/year (C3 35%)

NGL

83,000 ton/year

(4) Lube Oil Consumption for Gas Separation

Lubricating oil consumption for gas Separation project:

		(Unit: kl)
	1984	1985
Engine Oil	12	82.0
Industrial Oil	32	\$8.46
Grease	0.037	0.13
Total	44.037	140.59

(Source: Constructor)

Note: Lube oil consumption in 1993 is same as in 1985.

### 7-2 Pertilizer Project

A fertilizer project in Thailand now under planning stage and the expected lube oil consumption by the project are shown in the table below.

[ ] 3 % of the control of the contro	Inbe Oil Consumption  (lit./1,000ton*)  Engine Industrial Gre oil Oil Gre  oric Acid 0.230  ate and 0.02 0.150  ate and 0.02 0.100 0.  * Based on Japanese experience  ** Completion date: October 1986  Inbe Oil Consumption in 1983 and 199  Engine Oil Consumption in 1983 and 199  Engine Oil Onsumption in 1983.
--	---

#### Rock Salt Project

10.25

15. 3.5 /

erioss food.

(1) Rock Salt Production

า **เราะวัดอุริสเซากล่อ**งกับ เลือดต่องอยากับ Production: 1,800,000 ton

- (2) Completion date: July 1985
- (3) Lubricating oil consumption for salt project:

20% on total consumption is engine oil and 5% is grease (estimated by the Consultant from the experience in Japan).

. <b>0</b>		PORT TO	isos and	(Unit:	kl)
		00 <b>616</b> 5 00040 maas	1983	11 X X P V . 0 19	93
r. 328 - 88.0	Engine Oil		0	1	Ó6
हरू मुंबरी, देखें के देशका	Industrial ( Grease	L Lucia Hada	0 1 2022-25 10 40		98 27
	Total	- 		5	31

Soda Ash Project

数据表达1991年1992

- (1) Production: 400,000 ton/year
- (2) Completion Date: July 1985
  - (3) Lube Oil Consumption: 139.7 kl

	industrial along (Unifer k1)
	<u> 1983</u> <u>1993</u>
Bngine 011	Similar (200 min similar)
Industrial Oil	the miles de on same setting 111
Grease (ton)	0.7
Total	139.7

1) Estimated by the experience in Japan.

#### 7-5 Petrochemical Project

	Oil Coms (kl/1,00	umption	Expected <sup>2</sup>	Lube C		
	Industrial Oil	Grease	Capacity (ton)	Industrial oil	Grease	Total
Ethylene Propylene	0.082	0.000355	300,000 73,000	25.0	0.01	25.01
LOPE	2.619	- 1 % 	73,500	192.0	-	192.0
норв	0.0614	0.0020	110,000	7.0	0.23	7.23
VCM	0.125		80,000	10.0		10.0
EĠ	0.0089	0.00021	50,000	0.4	0.01	0.41
PP	0.002225	0.0056	70,000	1.6	0.39	1.99
				236.0	0.64	236.64

Notes: 1) Source: Estimated by the experience in Japan

2) Completion date: 1987

#### LUBRICATING OIL CONSUMPTION IN 1983 AND 1993

State of the

•		:		(Unit	: kl)
-			1983		1993
Industrial	011	e e e	Ó		236.0
Grease		<u> </u>		<u> </u>	0.64
Total			0		236.64

#### 7-6 Caustic Soda Project

Chlorine projection from caustic soda project meets to chlorine for vinyl chloride production.

Caustic soda production will be 55,000 ton/year, and completion date is in 1987.